

LISTING OF THE CLAIMS

4 (currently amended): In a method for producing a thick grain-oriented electrical steel sheet with excellent properties, the method comprising:

preparing a slab comprising consisting essentially of, by weight, 0.025 - 0.075% of C, 2.5 - 4.5% of Si, 0.025 - 0.035% of acid soluble Al, 0.0060 - 0.0086% of N, 0.070 - 0.161% of Mn, 0.005 - 0.029% of S, one or more elements selected from the group consisting of Se, Sb, Cu, Nb, Cr, Sn, Ti and Bi, and the balance being iron and unavoidable impurities;

heating the slab to a temperature not higher than 1,300°C, hot rolling the slab to a hot-rolled sheet, optionally annealing the hot-rolled sheet,

cold rolling the hot rolled sheet to a cold-rolled sheet by a reduction ratio of not less than 80% by using a one stage cold rolling or two or more stages of cold rolling with intermediate annealing,

said cold rolling providing the sheet with a final thickness of 0.36 - 1.00 mm,

decarburization annealing the cold-rolled sheet for decarburization of the sheet at a temperature of 700 - 1,000°C,

treating the cold-rolled sheet for nitriding by using NH₃ gas, and final annealing,

~~wherein the improvement comprising the sheet having a final thickness of 0.36 to 1.00 mm,~~

setting C-content to not greater than 0.0050% by weight after decarburization annealing of the sheet,

setting total N-content to 0.010 - 0.027% by weight after nitriding treatment of the sheet in NH₃ gas following said decarburization annealing,

coating the nitrided sheet with an annealing separation agent consisting essentially of MgO and subjecting the coated sheet to final annealing as a coil having a coil inside diameter within a range of 200 - 1500 mm to obtain grains of a selected diameter, its grains of a diameter exceeding 5 mm having a crystal orientation deviation (Δθ) of 0.2 - 4 degrees in relation to that at the grain center, and a post-final-annealing SF value of less 0.80, where SF is defined as

SF = (grain area x 4π)/(grain boundary length)²,
whereby a magnetic flux density B_s of the sheet is not less than 1.83T and core loss W_{17/50} (w/kg) of the sheet is not more than 3.3 x t + 0.35.

5 (previously presented): The method according to claim 4, comprising:

final annealing the coil adjusted to a coil inside diameter of 600 mm.

6 (previously presented): The method according to claim 4, comprising:

decarburization annealing of the cold-rolled sheet for 120 seconds to 250 seconds at 800°C to 900°C in an atmosphere of 25% N₂, 75% H₂ with a dew point of 60°C to 75°C; and

following said decarburization annealing,
subjecting the sheet to nitriding treatment for 10 to 60
seconds at 700°C to 900°C in an atmosphere of dry NH₃ gas.